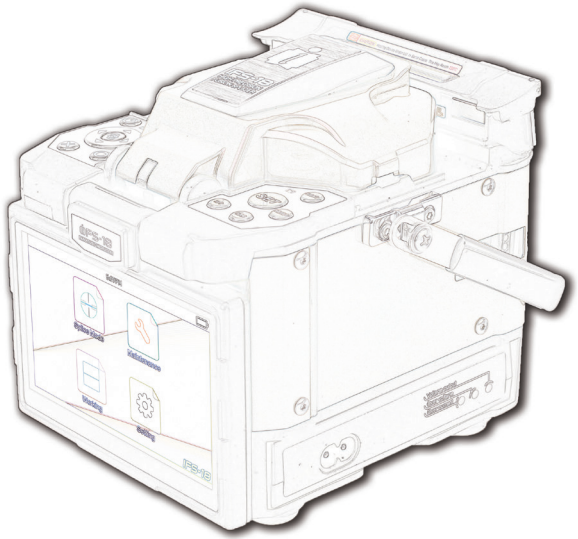
# iFS-18

HIGH PRECISION FUSION SPLICER

# User's Manual

Version:V0.02



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# Introduction

Thanks for choosing IFS-18 High precision fusion splicer from INNO. The IFS-18 with innovative design and exquisite manufacturing technology bring customers unprecedented splicing experience.
New technology greatly reduce splicing and heating time. Advanced estimate method and core alignment technique ensure the accuracy of splice loss estimation.
Its small size, compact design and reliable protection shell make it suitable for any operating environment. Dynamic operation interface and automatic splice mode give the customers great convenience.

For more information on IFS-18, please visit our web
www.innoinstrument.com

iFS-18
HIGH PRECISION FUSION SPLICER

Model: FH-18
Universal Fiber Holder specialized for factory

This manual explains the features, specifications, operation, maintenance and warnings about IFS-18. The primary goal of this manual is to make the user be familiar with the splicer as soon as possible.

**Important!**
INNO Instrument recommends all users to read this manual carefully before operating IFS-18.

# Chapter 1-Technical Specifications

## Applicable Fiber Type

* SM(ITU-TG.G652) I MM(ITU-TG.651)/DS(ITU-TG.653)/NZDS(ITU-TG.655)/ ITU-TG.657/HP980/HI1060/HI1060FLEX/SM0.08mm
* Fiber count: Single
* Applicable fibers: 0.08mm/0.125mm/0.25mm/0.9mm
* Applicable fiber diameter: Cladding diameter: 80-150μm, Coating diameter: 100-1000μm

## Splice Loss

Measured by cut-back method relevant to ITU-T standard

* SM: 0.02dB
* MM: 0.01dB
* DS: 0.04dB
* NZDS: 0.04dB
* G.657: 0.02dB

## Splice Mode

* Preset 42 splice modes
* Internal splice data storage: 2000
* Splicing time: SM FAST mode: 7s

## Heat Oven

* Applicable protection sleeve: 20mm, 30mm, 40mm, 50mm, 60mm
* Heating time: 20-900s
* Cooling time: 0- 180s
* Typical heating time: 35s
* Heater mode: 32 heat modes, preset 5 heat modes
* Heat oven: IFS-18 Special Heat Oven

## Power Supply

* Input power: AC 100-240V, 50-60HZ.
* Li-ion battery input: DC 9~14V.

## Dimensions and Weight

* Size: Length x Width x Height = 160mm x 145mm x 148mm
* Weight: 2.15 kg (AC adapter included) 1.9kg

## Environment

* Operating condition: 0-5000m above sea level, 0-95% relative humidity, -10-50**℃** . 15m/s wind.
* Storage condition: 0-95% relative humidity, -40-80**℃** ; Battery: -20-30**℃** for long time storage.

## Other

* Viewing Method: two camera and 5.0 inch color LCD monitor.
* 300x magnification for single X or Y view, or 180x for both X and Y view.
* Mechanical proof test: 1.96- 2.25 N.
* Terminals: USB2.0 for upgrading.

## Warnings For Batteries

**1) Never strike batteries with any sharp edge parts.**
**2) Never transport or store batteries together with the metal content.**
**3) Never throw, drop, impact or bend battery body. Never knock the battery with the hammer nor thread on it.**
**4) Never short-circuit the battery by connecting the positive and the negative terminal with metal content like wires.**
**5) Never make the positive or negative terminals in touch with the aluminum backing of polymer-aluminum packaging material, it will make the battery short circuit.**
**6) Do not disassemble the battery Cells in any event.**
**7) Never dip battery into the water or seawater, the cells should be keep from moisture.**
**8) Never use or leave the battery near a heat source as fire or heater.**
**9) Never apply direct heat to the battery or put it into the water.**
**10) Never directly solder the battery.**
**11) Never charge batteries near the fire or in a hot environment.**
**12) Never put batteries into the microwave oven or any high pressure vessel.**
**13) Avoid long-term use of the battery or leave it at high temperature (for example, in the strong sunlight or inside your car in extreme temperatures), otherwise it will cause the battery be overheated, on fire, function decline or its service life be decreased.**
**14) Never use the damaged battery. The battery which electrolyte was leaked or there's a smell of electrolyte should be far away from fires to avoid the battery on fire or explode.**
**15) In case the electrolyte was leaked and came into contact with the skin or any other parts of the body, rinse immediately with clear water. If the electrolyte come into contact with the eyes, see a doctor nearby after rinsing with clear water.**

# Chapter 2 - Installation

## Safety Warnings and Cautions

As IFS-18 is designed for fusion splicing silica glass optical fibers, it is very important that the splicer should not be used for any other purpose. The splicer is a precision instrument and must be handled with caution. Therefore, you must follow all safety rules and general precautions in this manual. Any behavior that not follow the warnings and cautions will break the safety standard about the fusion splicer and may result in electric shock, fire, and/or serious injury. INNO will not take the responsibility for those results caused by misuse!

### Safety Warnings

① **Never operate the splicer in an environment where flammable liquids or vapors exist.**
② **Do not touch the electrodes when the splicer is on and power is supplied to the unit. The electrodes generate high voltage and high temperatures that may cause a severe shock or burn.**

**Note:** Only use specified electrodes for the fusion splicer. Select [Replace Electrodes] option to replace electrodes. Turn the splicer off and disconnect the AC power cord or remove battery before replacing electrodes. Discharging is prohibited before the electrodes are placed as a pair.

③ Do not disassemble or modify the splicer, AC adapter, battery or battery charger. In particular, do not remove or bypass any electrical or mechanical device (e.g. a fuse or safety switch) incorporated into the design and manufacture of this equipment. The equipment must be repaired or adjusted by an authorized technician or engineer. Unauthorized repair may result in fire or electric shock.
④ Properly connect the AC power cord to the splicer(inlet) and wall socket (outlet). When inserting the AC plug, make sure there is no dust or dirt on the terminals. Engage by pressing the female plug into the splicer (inlet) and the male plug into the wall socket (outlet) until both plugs are fully seated. Incomplete engagement may cause fuming, electric shock, or equipment damage and may result in injury, death, or fire.
⑤ Never operate the splicer in an environment where flammable liquids or vapors exist. Risk of dangerous fire or explosion could result from the splicer's electrical arc in such an environment. Do not operate splicer near hot objects, in high temperature environments, in dusty/humid atmospheres, or when water-condensation is present on the splicer. This may result in electric shock, splicer malfunction, or poor splicing performance.
⑥ Safety glasses should always be worn during fiber preparation and splicing operation. Fiber fragments can be extremely dangerous if they come into contact with the eye, skin, or are ingested.
⑦ Disconnect the AC power cord from the AC adapter inlet or the wall socket (outlet) immediately if user observes the following or if the splicer receives the following faults:
- Fumes, bad smell, noise, or over-heating occurs.
- Liquid or foreign matter falls into cabinet.
- Splicer is damaged or dropped.

If any of these faults occurs, ask our service centre for repair. Leaving the splicer in a damaged state may cause equipment failure, electric shock, or fire and may result in injury or death.
⑧ Do not use compressed gas or canned air to clean the splicer. They may contain flammable materials that could ignite during the electrical discharge
⑨ Use only the AC adapter designed for this splicer. Using an improper AC power source may cause fuming, electric shock, or equipment damage and may result in injury, death, or fire. Proper AC power source is AC 100~240v, 50~60Hz. Check the AC power source before use.
⑩ Use the supplied AC power cord. Do not place heavy objects on the AC power cord. Keep the power cord away from heat source. Use of an improper cord or a damaged cord may cause fuming, electric shock, or equipment damage and may result in injury, death, or fire.

### Maintenance and External Care Precautions

① Always avoid using hard objects to clean V-grooves and electrodes.
② Do not use any chemical other than pure alcohol (99% or greater) to clean the objective lens, V-groove, LEDs, LCD monitor, etc., of the splicer.
③ Use a dry cloth to remove dust and dirt from the splicer.
④ If the outside of the splicer is dirty, plunge a soft cloth into diluted neutral washing up liquid, wring out the cloth and clean. Dry the splicer with a dry cloth but DO NOT use furniture polish or other cleaning agent.
⑤ Always follow the maintenance instructions in this manual.

### Transport and Storage Precautions

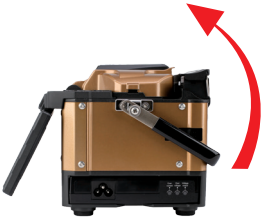
① When the splicer is moved from cold to warm environment, you should allow the splicer to warm up gradually. Otherwise, the condensation generated inside will be harmful for the splicer.
② Pack the fusion splicer for long time storage.
③ Keep the splicer clean and dry.
④ The fusion splicer is precision adjusted and aligned. Always keep the slicer in its carrying case to protect from damage and dirt. Put cushion package outside the carry case for long distance transporting.
⑤ Always avoid leaving the splicer in direct sunlight or expose to excessive heat.
⑥ Do not store the splicer in dusty/humid atmospheres. This may result in electric shock, splicer malfunction, or poor splicing.
⑦ Keep the humidity to a minimum level where the splicer is stored. The humidity must not exceed 95%.

## Installation

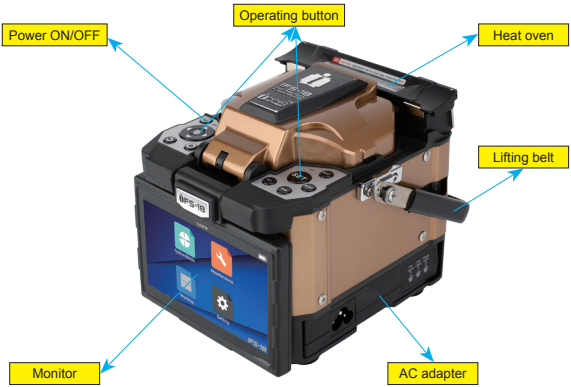
Important!
Please carefully follow the instructions below.

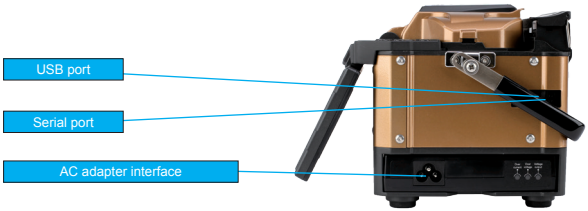
### Unpacking the Splicer

Check the belt and hooks for damage before taking the splicer out.
Lift the splicer by the lifting belt as show below:



## Splicer Description and Functions

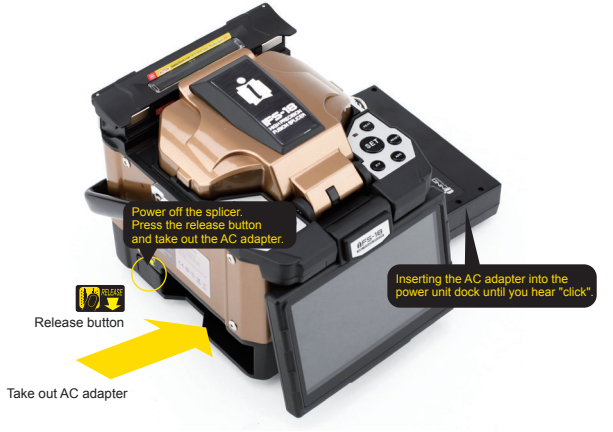


# Power supply

## AC adapter

1. Installation diagram is shown as follow.


Power off the splicer.
Press the release button
and take out the AC adapter.
Inserting the AC adapter into the
power unit dock until you hear "click".
RELEASE
Release button
Take out AC adapter

2. The connection diagram is shown as follow.

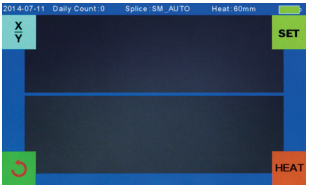
# Chapter 3 - Basic Operation

## How to Install Cleaving Table

Fix the cleaver on the Cleaving Table by matching screw.

## Turning Splicer "ON"

Press "POWER" button on the operation panel. The ready screen is displayer after the motors rest to their initial positions.

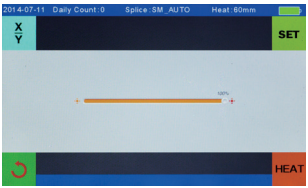



### Adjust the Angle of LCD Monitor

Adjust the monitor angle to comfortably watch the screen.

## Adjust the Monitor Brightness

In the initial interface, press "←" or "→" to change the monitor brightness until it is clear enough.



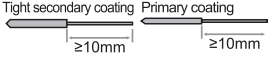

**Note:** The LCD monitor of IFS-15 manufactured in a quality-controlled factory environment. However, some black dots may appear, or red/blue/green dots may remain on the screen. The screen brightness may not appear uniform, depending on the viewing angle. Note that these symptoms are not defects, but are natural on LCDs.

## Preparing the Fibers

3 steps for preparing fibers:
Step 1: Strip the fiber
① Remove at least 50mm of secondary coating (valid for both tight and loose tube secondary coating) with an appropriate stripper.
② Remove approximately 30mm of primary coating with an appropriate stripper.
Step 2: Clean the fiber
Clean the bare fiber thoroughly with alcohol impregnated gauze or lint-free tissue.
Step 3: Cleave the fiber
Cleave the fiber by high precision fiber cleaver. In order to get excellent splice result, high precision fiber cleaver should be used, such as INNO VF- fiber cleaver. And the cleave length also should be precisely controlled (shown below).

**Note:**
Always remember to slip a heat-shrink sleeve onto either end of the fibers at the beginning of each fiber preparations.

Examples of cleaving length

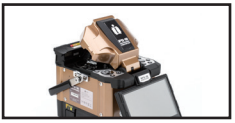



**Important!**
From this point, you must be very careful with the fibers to ensure that they do not become dirty again.
- avoid putting them down on a dusty working surface
- avoid waving them around in the air.
- check if the V-grooves are clean, if not, wipe them clean
- check if the fiber clamps are clean, if not, wipe them clean

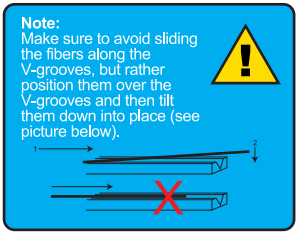
# How to Make a Splice

## Setting Fiber in the Fiber Holder

① Open the wind shield.
② Raise the fiber clamps.
③ Place the fibers into V-grooves.
④ Make sure the fiber ends are visible on the monitor.
(4a) If the fiber ends are not visible, the splicer will try to find them by moving the fibers horizontally. The ends will be found if the fibers are placed within the mechanical movement range of the horizontal motors.
(4b) If not, an error message will be displayed. The splicer will not find fiber ends that are placed above or below the imaging area.
(4c) Normally, this should only happen if the V-grooves or the fibers are dirty, or if the splicer is not well adjusted.



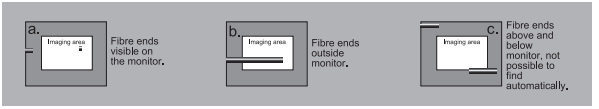
**Note:**
Make sure to avoid sliding the fibers along the V-grooves, but rather position them over the V-grooves and then tilt them down into place (see picture below).

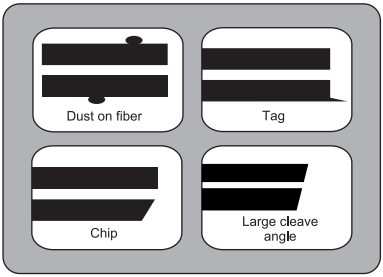



**⑤ Clamp the fiber in position by lowering both sets of fiber clamps.**
**⑥ Close the safety shield.**

## Inspecting the Fibers

Make sure the fibers are clear and be well cleaved before you proceeding the splice.
If you find any defects as illustrated above, remove the fibers and prepare again.






Note: The fibers are checked automatically when you press "Set" button. The splicer automatically focuses the fibers and checks for damage or dust particles.

### Splice

① Select the appropriate splicing mode.
② Press "SET" to start splicing.

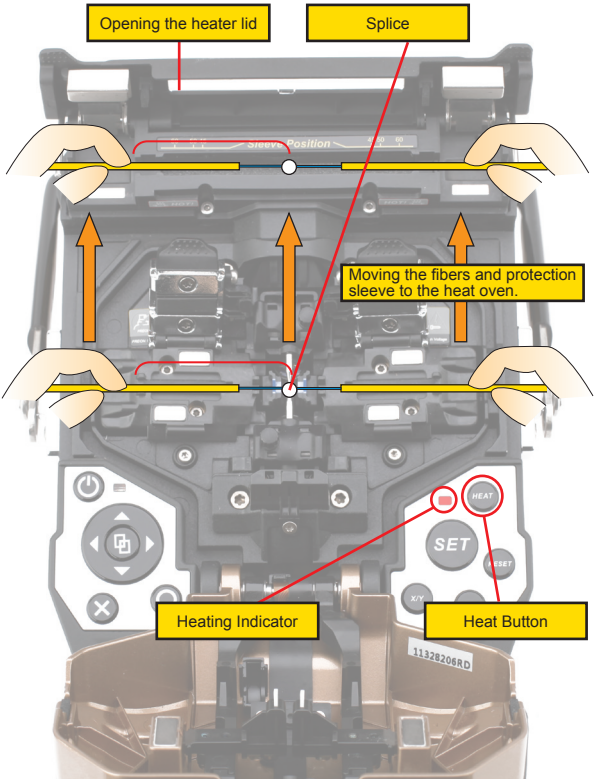
**Note:** If the splicer set as "Auto Mode", the fibers splice once the protection shield closed.

## How to Protect the Splice

After splicing, protect the joint by using a heat-shrink sleeve and the heat oven which is mounted onto the splicer.

### Heating Procedure

① Open the heat oven lid.
② Lift the left and right fiber clamps on the splicer.
Holding the heat-shrink tube (previously placed onto the fiber), lift the spliced fibers and holding them taut, move the heat-shrink tube so that it is centered over the splice point.
③ Move both the fibers and the heat-shrink tube over to the heat oven and place them in the oven clamps.
④ Press "HEAT" to start. After heating, the led indicator will go out with buzzing.


Opening the heater lid
Splice
Moving the fibers and protection sleeve to the heat oven.
Heating Indicator
Heat Button
HEAT
SET
11328206RD

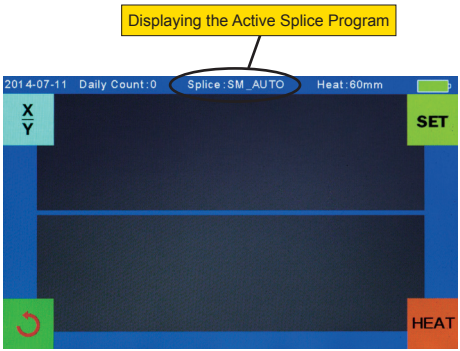
# Chapter 4 - Splice Programs

IFS-18 has an intuitive and simple, but very powerful program structure. Splice programs define arc currents, splice times as well as various parameters used when performing a splice. Therefore, it is essential to select the correct splice program in accordance with the type of fiber you want to splice.

There are a number of "pre-defined" splice programs for common fiber combinations (see below). However, it is also easy to either modify or write new splice programs to further optimize the parameters for more unusual fiber combinations. (These are known as "user-defined" programs.)

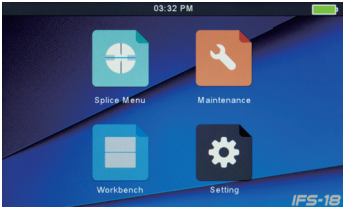
## Displaying the Active Splice Program

The active splice program is always displayed at the top of the screen (see below). The splicer uses this program when you press “confirm” in Main menu:

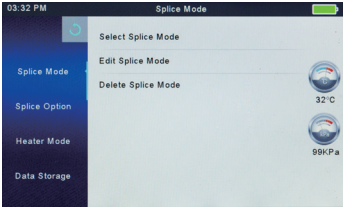


# 选择熔接模式

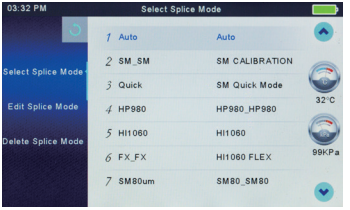
① Select "Splice Mode" from the "Main menu".



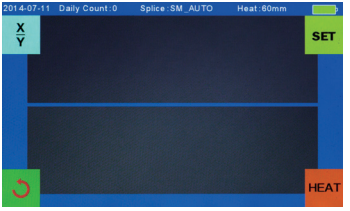

② Select appropriate splice program.




**③ Select the splice mode you want.**




④ Press "RESET" return to the initial interface to check the selected splice program.



# General Splicing Steps

This section explains the steps involved in automatic splicing process and describes how various program parameters are related to this process. The normal splicing process can be divided into two sections; prefusion and fusion.

## Prefusion

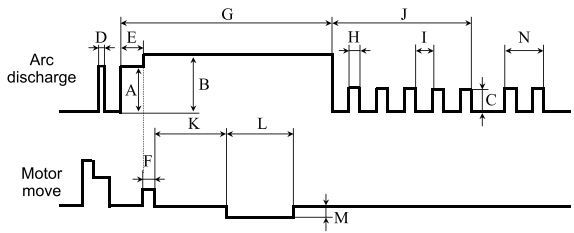
During prefusion, the splicer performs automatic alignment and focusing, where the fibers are subjected to a low prefuse current for cleaning purposes; a prefuse image is also taken. At this point, the user is informed of any problems recognized in the prefuse image, such as a poorly prepared fiber. The splicer will then issue a warning before the fibers are fused together.

## Fusion

During fusion, the fibers are joined together and subjected to five different currents as illustrated below. An important parameter, which changes during splicing, is the distance between the fibers. During Pre-fusion, the fibers are apart. With the current phase changing, fibers are splicing gradually.

## Splicing Process

Arc power and Arc time are considered the two most vital parameters. How those parameters affect the splicing process will be described in next section "Splice option".
Below is a figure showing the arc discharge conditions (relationship between "Arc power" and "Motor motion"). These conditions can be edited by changing the splicing parameters listed below. Depending on the splice mode, certain parameters cannot be changed.




A: Prefuse Power
B: Arc Power
C: Cleaning Arc
D: Prefuse Time
E: Overlap
F: Arc Time
G: Taper Wait Time
H: Taper Time related to Taper Length
I: Taper Speed
J: Rearc Time

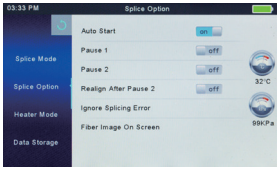
# Standard Mode

| Parameter | Description |
|---|---|
| **Template** | A list of splice modes stored in the splicer database. Upon inputting the appropriate mode, the selected splice mode stored in database area is copied to a selected splice mode in user-programmable area. |
| **Name** | Title for a splice mode expressed in up to seven characters. |
| **Note** | Detail explanation for a splice mode expressed in up to 15 characters.<br>Title is displayed at [Select Splice Mode] menu. |
| **Align Type** | Sets the aligning method for the fiber.<br>"Core": Aligns fiber's core.<br>"Manual": Aligns by hand movement. |
| **Arc Adjust** | Sets to adjust arc power according to the fibers' conditions. |
| **Pull Test** | **If** [Proof Test] is set to "ON", a pull-test is performed upon opening the wind protector after splicing or by pressing the SET. |
| **Loss Estimate** | Loss estimate should be regarded as a reference as the estimated splice loss may not be correct in some cases, depending on the fiber properties. |
| **Min Loss** | This amount is added to the estimated splice loss originally calculated. When splicing specialty or dissimilar fibers, a high actual splice loss may occur even with optimized arc conditions. To make the actual splice loss concur with the estimated splice loss, set the minimum value of estimate to the minimum optimized actual splice loss. |
| **Loss Limit** | An error message is displayed if the estimated splice loss exceeds the selected threshold (loss limit). |
| **Core Angle Limit** | An error message is displayed if the bend angle of the two fibers spliced exceeds the selected threshold (Core Angle Limit). |
| **Cleave Angle Limit** | An error message is displayed if the cleave angle of either the left or right fiber ends exceed the selected threshold (Cleave Angle Limit). |
| **Gap Position** | Sets the relative position of the splicing location to the center of electrodes. Splice loss may be improved in the case of dissimilar fiber splicing by shifting [Gap Position] towards a fiber whose MFD is bigger than the other fiber MFD. |
| **Gap** | Sets the end-face gap between the left and right fibers at the time of aligning and pre-fusion discharge. |
| **Overlap** | Sets the overlap amount of fibers at the fiber stuffing stage. Relatively small [Overlap] is recommended if the [Prefuse Power] is low, while relatively large [Overlap] is recommended if the [Prefuse Power] is high. |
| **Clean Arc Time** | A cleaning arc burns out micro dust on the surface of the fiber with an arc discharge for a short period of time. The duration of the cleaning arc can be changed by this parameter. |
| **Preheat Arc Value** | Sets the power of the prefuse arc, which is an arc discharge occurring from the beginning until the fibers begin stuffing. **If** [Prefuse Power] is set too low, axial offset may occur if cleaved angles are relatively poor. **If** [Prefuse Power] is set too high, fiber end faces are fused excessively and splice loss gets worse. |
| **Preheat Arc Time** | Sets the duration of the preheat arc. |
| **Fuse Arc Value** | Set Arc Power |
| **Fuse Arc Time** | Sets Arc Time |

# Chapter 5 - Splice Option

## Setting Parameters

① Select [Splice Option] in "main menu".
② Click your item and change the parameter.




| Parameter | Description |
|---|---|
| **Auto Start** | If "Auto Start" is set to "ON", splicing starts automatically as soon as the wind protector is closed. Fibers should be prepared and placed into the splicer in advance. |
| **Pause 1** | If "Pause1" is set to "ON", splicing operation pauses when fibers are forwarded to gap-set position. Cleave angles are displayed during the pause. |
| **Pause 2** | If "Pause 2" is set to "ON", splicing operation pauses after fiber alignment is completed. With ECF "ON", core-to-core alignment is made after this pause. |
| **Realign After Pause2** | If "Realign After Pause 2" is set to "ON", splicing restarts to align fibers after operated "Pause 2." |
| **Ignore Splice Error** | |
| **Cleave Angle** | Setting to "Disable" prevents the splicer from continuing a splice even if the message "Cleave Angle Error" is disregarded. |
| **Core Angle** | Setting to "Disable" prevents the splicer from continuing a splice even if the message "Core Angle Error" is disregarded. |
| **Loss** | Setting to "Disable" prevents the splicer from normally finishing its operation event if the message "Loss Error", "Cleave Shape Error", "Bubble Error", "Fat Error" or "Thin Error" is disregarded. |
| **Fat** | |
| **Thin** | |
| **Fiber image displaying on the LCD monitor** | |
| **Pause 1** | Sets the method of displaying the fiber image on the screen during splicing operation. |
| **Align** | |
| **Pause 2** | |
| **Arc** | |
| **Estimate** | |
| **Gap set** | |

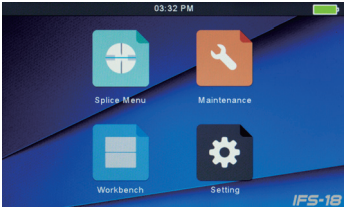
# Chapter 6 - Heater Mode

There are 32 heating modes and preset 5 heating modes by INNO factory. The others could be defined by users. Select the one best suited for the protection sleeve used.

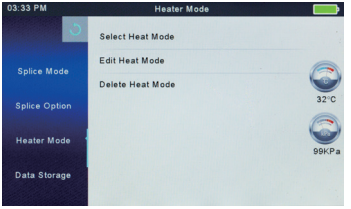
For each type of protection sleeve, IFS-18 has its optimum heating mode. These modes can be found in the database area for reference. Copy the appropriate mode and paste it to the user-programmable area. The operator can edit the user-programmable modes.

## Selecting Heater Mode

Select "Splice mode" and then enter the "Heating mode" menu.



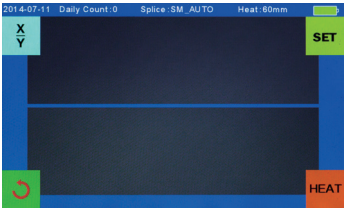

① Select [Heating Mode] menu from "main menu".




② Select [Select Heater Mode] menu.

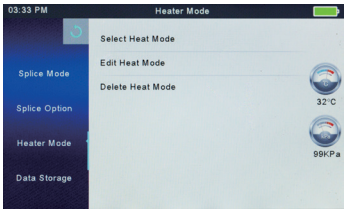
③ **Select the heater mode.**

④ Press "RESET" to return to the initial interface to check the heater mode selected.



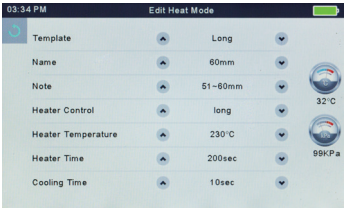

## Editing Heater Mode

Tube-heating conditions stored in heater mode can be edited or changed.




(1) Select [Edit Heater Mode] through [Heater Mode] menu.

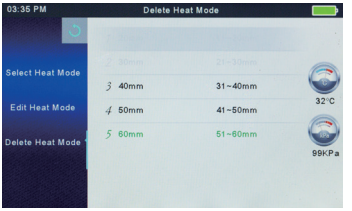
(2) Select the mode to be edited.




(3) Select the parameter to be changed, and edit it.

## Erasing a Heater Mode

① Enter [Heating Mode] menu.
② Select [Delete Heater Mode].
③ Select the heater mode to delete.




Note: The mode shown in gray (20mm, 30mm) is the system default initial mode and could not be delete.

| Parameter | Description |
|---|---|
| **Template** | Sets sleeve type. List of all heating modes are displayed. The selected mode will be copied to a user-programmable mode. |
| **Name** | Title for a heater mode expressed in some characters |
| **Note** | Title of a heater mode that is displayed in the lower right part of the monitor during the splicing/heating process. Max number of characters used is 5. |
| **Heater Control** | Sets the heater control sequence.<br>Long: the protection sleeve over 30 mm.<br>Short: the protection sleeve below 30mm. |
| **Heat Temperature** | Sets heating temperature. |
| **Heat Time** | Sets heating time from the beginning to the heating completed. |
| **Cooling Time** | Cooling fan operating time. |

# Chapter 7 - Maintenance Menu

The splicer has a function to perform routine maintenance. This section describes how to use the maintenance menu.

(1) Press "menu" button, select [maintenance menu].

(2) Select a function to perform.

## Replace Electrodes

During arc process, the oxide generated on the tips of electrodes. It is recommended that the electrodes should be replaced after 3,500 arc discharges. When the number of arc discharges reaches a count of 3,500, a message prompting to replace the electrodes is displayed immediately after turning on the power. Using the electrodes without a replacement will result in greater splice loss and reduced splice strength.

### Replacement Procedure

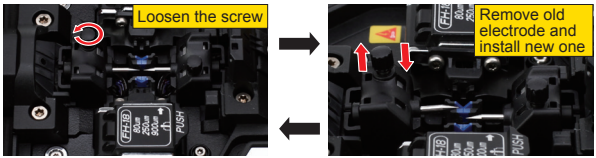
(1) Execute [Replace Electrodes] in [Maintenance Menu].

(2) Instruction messages will appear on the screen to turn off the power, then power off.

(3) Remove the old electrodes.

(i) Loosen screw located on electrode cover.

(ii) Take electrode out of electrode cover. (Electrode fits into electrode cover)




(4) Clean the new electrodes with alcohol-impregnated clean gauze or lint-free tissue and install them in the splicer.

(i) Insert the electrode in the electrode cover.

(ii) Place the electrode cover on the splicer and tighten screw.

Attention: Do not pull out wiring when replacing electrode.
Tighten the screw firmly with fingers.

(5) INNO recommends all operators to do stabilizing electrodes and arc calibration after electrodes replacing to keep good splice results and splice strength. (Details will be described below. )

## Stabilize Electrodes

In the event of sudden change in environmental conditions or after cleaning electrodes, the arc power sometimes becomes unstable, resulting in higher splice loss. Especially when the splicer is moved from lower altitudes to higher altitudes, it takes time for the arc power to stabilize. In this case, stabilizing electrodes will expedite the process to set the arc power stable. If many tests are needed to get the "Test OK" message appears in [Arc Calibration], use this function as well.

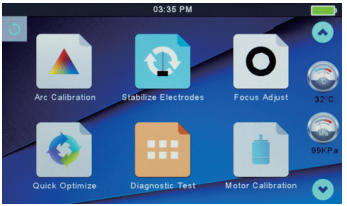
### Operation Procedure

(1) Select [Stabilize Electrodes].
(2) Load prepared fibers on V-groove of the splicer for splicing.
(3) Press SET and the splicer begins to stabilize the electrodes in the following ways:
* Repeats short arc discharge five times to measure the arc position.
* Performs [Arc calibration] to calibrate the arc power.
* Perform 20-cycle continuous discharge to stabilize the electrodes.

## Diagnostic Test Function

IFS-18 has a built-in diagnostic test feature that allows the user to perform a simple one step evaluation of splicer performance covering several different critical variables. Perform this function in the event of splicer operation trouble.

### Operation Procedure




(1) Select [Diagnostic Test ] in [Maintenance Menu].

(2) The following checks will be made.

| ID. | Check Item | Description |
|---|---|---|
| 1 | LED Calibration | Measures and adjusts the brightness of LED. |
| 2 | Dust Check | Checks the optical path for dust or dirt and judges whether they disturb fiber observation. If contamination exists, this function indicates the location. |
| 3 | Motor Calibration | Automatically calibrates the motor speed. |
| 4 | Arc Calibration | Automatically calibrates the arc power factor and fiber splicing position. |

## Dust Check

During normal splicing, the splicer observes fibers through image acquisition and processing. Dust or contaminants on the cameras and lenses disturbs normal observation of fibers and may result in improper splicing. This function checks the optical path for the presence or absence of contaminants and judges whether they cause trouble for fiber splicing.

### Operation Procedure

(1) Select [Dust Check] in [Maintenance Menu].
(2) If fibers are set in the splicer, remove them and press "SET" button to start the dust check.
(3) If contamination is discovered during the process, the message "Find dust on the camera lens" will be displayed on the screen. Press back button two times, the location of contamination will shown on the screen. Clean the objective lenses and redo [Dust Check] until the message "Operation Completed" is displayed.

Note: If contamination still exists after cleaning the objective lenses, please contact with the agent.

## Motor Calibration

Motors are adjusted at the factory before shipping. However, settings can be changed in various reasons. This function automatically calibrates the speed of all 6 motors.

### Operation Procedure

(1) Select [Motor Calibration] in [Maintenance Menu].
(2) Load prepared fibers in the splicer and press SET button.
(3) Speeds for all motors are automatically calibrated. The message "Operation Completed" will be displayed if the operation is completed.

**Note:** Perform this function when "Fat" or "Thin" error occurs, or fiber aligning or focusing takes too much time.

## Arc Calibration

Atmospheric conditions such as temperature, humidity, and pressure are constantly changing, which creates variability in the arc temperature. This splicer is equipped with temperature and pressure sensors that are used in a constant feedback monitoring control system to regulate the arc power at a constant level.
However, changes in arc power due to electrode wear and glass adhesion cannot be corrected automatically. Also, the center position of arc discharge sometimes shifts to the left or to the right. In this case, the fiber splicing position has to be shifted in relation to the arc discharge center. It is necessary to perform an arc power calibration to eliminate those problems.

**Note:** Performing [Arc Calibration] function changes the arc power "factor" value. The factor value is used in the algorithm program for all splicing. The arc power value will not change in the splice modes.

### Operation Procedure

(1) Select [Arc Calibration] in [Maintenance Menu] to display Arc Calibration on the screen.
(2) Set prepared fibers on the splicer and press SET to execute arc calibration.

Note: Use standard SM or MM fiber for arc calibration.
Use well-prepared fibers for arc calibration. Dust on the fiber surface affects arc calibration.

(3) After arc calibration, there are two values show on the screen. If the right value achieves 11±2, the message "Test Finished " will be display. Otherwise, multiple iterations of arc calibration are needed until the message "Test Finished" is displayed.

## Electrode Setting

Set the electrode change warnings. INNO recommends that replace the electrodes every 3,500 discharge to keep perfect splice results.
(1) Select [Electrode Setting] in [Maintenance Menu] to display Setting Electrodes on the screen.
(2) Set Electrode Caution and Electrode Warning.

| Parameter | Descriptions |
|---|---|
| Electrode Caution | The caution message "Caution! Please Replace the electrodes" will be displayed on the screen when the number of splice over the setting number. INNO recommends that this parameter to be set as 3500. |
| Electrode Warning | The warning message "Warning! You must replace electrodes" will be displayed on the screen when the number of discharge exceeds the setting number. INNO recommends that this parameter to be set as 5000. |

## Software Upgrading

**① Select [Update Software] in [Maintenance Menu].**
**② Connect the driver contains upgrading files to the USB port.**
**③ Press OK to upgrading automatically. The splicer will restart after upgrading.**

# Chapter 8 - Other Functions & Utilities

## Data Storage

This splicer stores up to 2,000 splicing results. Contents of data stored are different depending on splicing mode.

### Display Splice Record

Splicing results stored in the memory can be displayed.
Select [Data Storage] Menu, then select [Display Splice Record] to check the records.

### Clearing Splicing Results in Memory

Splicing results can be cleared by part or whole.
(1) Select [Clear Splice Memory] and Input specific number (begin-number and end-number) of splicing results to be cleared.
(2) Select [Clear Splice Record] to execute clearing.

### Cancel Data Storage

If you don't want to store the records, select <ON> in the [Cancel data storage] Menu.

## System Setting

This menu is used to change system parameters and set user authority.

| Parameter | Descriptions |
|---|---|
| Buzzer | Sets the volume of the buzzer |
| Temperature Unit | Sets the unit of temperature |
| Automatic Heating | Set this function "ON", the splicer start to heat automatically when the spliced fiber placed into the heat oven. |
| Language | Sets a language to be displayed on the screen. Select a language to be displayed. |
| Monitor Position | Sets the operational direction of splicer. [Front] is for front monitor operation. [Rear] is for rear monitor operation. Refer to next page for detail. |
| Power On Option | Sets the start-up screen image and function. This menu is secured by password. |
| Power Save Option | Sets the power saving mode. |
| Set Calendar | Sets the system time. |
| Password | Changes the password to access specific menu, such as the [Power On Option], [Menu Lock] and so on.<br>At the time of shipment from factory, the password is set at "0"[zero]. If you have forgotten your password, contact with the sales agent. |

## Change Monitor Position

The splicer is shipped from the factory with default setting for "Monitor Front" operation. This can be changed to "Monitor Rear" operation. When [Monitor Position] is changed, the direction of the arrow keys is reversed.

Operating procedure:
① Select [Monitor Position] in [System Setting] menu.
② **Select a monitor position as you like (front/rear).**

Note: Press "↑ ↓" to swift the monitor position quickly.

## Power Save

This function is important for battery conservation. If the power saving function is not set during battery pack use, the number of splicer cycles will be reduced.
(1) Insert a power unit and turn splicer power on.
(2) Select [Power Save Option] in the [System Setting]. [Power Save Option] is displayed for the type of power supply used.
(3) Change value of [Monitor Shut Down] AND [Splice Shut Down].

| Parameter | Descriptions |
|---|---|
| Monitor Shut Down | Setting this function turns off the power supply to the LCD monitor if the splicer does not operate after a certain period of time. Always set this function to a specific shut-down time when using a battery pack. When the power supply for LCD monitor turns off, the LED near key blinks. Press any key to turn on the LCD monitor. |
| Splicer Shut Down | Automatically turns off the power supply of the splicer if it performs no operation for a certain period of time. The function serves to prevent the battery capacity from running low if the splicer is left on for an extended period of time. |

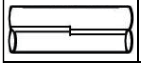
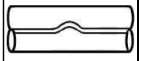
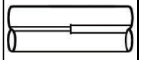
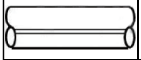
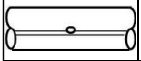
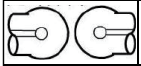
# System Information

Select [System Information], the following information is displayed.

| Parameter | Descriptions |
|---|---|
| Serial Number | Displays the serial number of the splicer. |
| Software Version | Displays the version number of the software |
| CPLD | Displays the version of CPLD |
| FPGA | Displays the version of FPGA |
| Total Arc Count | Displays the total number of arc discharges. |
| Current Arc Count | Displays the current number of arc discharges. |
| Last Maintenance | Displays the date of last maintenance. |
| Date of production | Displays the date of production. |

# Appendix I

Splice loss increase: Reason and solution.

| Symptom | Name | Reason | Solution |
|---|---|---|---|
|  | Core Axial Offset | Dust on v-groove or fiber clamp chip | Clean v-groove and fiber clamp chip. |
| | Core Angle | Dust on v-groove or fiber clamp chip | Clean v-groove and fiber clamp chip. |
| | | Bad fiber end-face quality | Check if fiber cleaver is well conditioned. |
| | Core Step | Dust on v-groove or fiber clamp chip | Clean v-groove and fiber clamp chip. |
|  | Core Curve | Bad fiber end-face quality. | Check if fiber cleaver is well conditioned. |
| | | Prefuse power too low or prefuse time too short. | Increase [Prefuse Power] and/or [Prefuse Time]. |
|  | MFD Mismatch | Arc power too low. | Increase [Arc Power] and/or [Arc Time]. |
|  | Combustion | Bad fiber end-face quality | Check the cleaver. |
| | | Dust still present after cleaning fiber or cleaning arc. | Clean fiber thoroughly or increase [Cleaning Arc Time]. |
|  | Bubbles | Bad fiber end-face quality | Check if fiber cleaver is well conditioned. |
| | | Prefuse power too low or prefuse time too short | Increase [Prefuse Power] and/or [Prefuse Time]. |
|  | Separation | Fiber stuffing too small | Perform [Motor Calibration]. |
| | | Prefuse power too high or prefuse time too long | Decrease [Prefuse Power] and/or [Prefuse Time]. |
| | Fat | Fiber stuffing too much | Decrese [Overlap] and perform [Motor Calibration]. |
| | Thin | Arc power not adequate | Perform [Arc Calibration]. |
| | | Some arc parameters not adequate | Adjust [Prefuse Power], [Prefuse Time] or [Overlap]. |
| | Line | Some arc parameters not adequate | Adjust [Prefuse Power], [Prefuse Time] or [Overlap]. |

**Note:** A vertical line sometimes appears at the splice point when MM fibers, or dissimilar fibers (different diameters) are spliced. This does not affect splice quality, such as splice loss or tensile strength.

# Appendix II

During the splice operating process, if the error messages is shown on the screen. Follow the solution precisely as shown in the list below. If it is not possible to eliminate the problem, the splicer may require service by a qualified service center. Please contact with sale agent.

| Error Message | Reason | Solution |
|---|---|---|
| L fiber place error | The fiber end-face is placed on the electrode centerline, or beyond it. | Press the "RESET" button. Reload the fibers, make sure fiber end face between v groove and the centre position of electrodes. |
| R fiber place error | | |
| Propulsion motor overrun | The fiber is not set correctly at the bottom of the V-groove, which results in that the fiber offsets beyond motor formation range. | Press the "RESET" button and then re-position the fiber at the bottom of the V-groove. |
| Propulsion motor trouble | Motor might be damaged. | Consult your nearest sales agency. |
| Failed to find the fiber end-face. | The fiber is not set correctly at the bottom of the V-groove. | Press the "RESET" button and then re-position the fiber correctly at the bottom of the V-groove. |
| No arc discharge | Arc Discharge does not occur. | Confirm the electrodes in proper position; Replace electrodes. |
| Motor overrun | The fiber is not set correctly at the bottom of the V-groove. | Press the "RESET" button and then re-position the fiber t at the bottom of the V-groove. |
| Cannot find the edge of the cladding | The fiber is not set correctly at the bottom of the V-groove. | Press the "RESET" button and then re-position the fiber at the bottom of the V-groove. |
| Find wrong fiber edges | There's dust on the fiber surface | Re-prepare the fiber ; Clean the lens and protector mirror and then redo "Dust Check". |
| Unidentified type of fibers | There's dust on the fiber surface | Re-prepare the fiber. |
| | The fibers of two sides are different type. | Use an appropriate splice mode when AUTO splice mode is unable. |
| | Non-standard optical fibers | AUTO splice mode can only identify the standard fibers such as SM, MM, NZ . |
| The edge of the fiber beyond the cross-border | The fiber's edge is not located in the view of Camera's field. | Adjust the fiber position, calibrate and maintain the motor. |

| Error Message | Reason | Solution |
|---|---|---|
| Focus Starting Position Error | Shock occurred to the splicer during the splicing process. | Execute "Motor Calibration". If the problem still exist, please contact the sale agent. |
| Contact Of Giber End-faces | Overlap too much. | Adjust overlap parameter. |
| | Motor is not calibrated | Calibrate and maintain the motor. |
| Focus Motor Overrun | The fiber is misplaced | Press the "RESET" button and then reposition the fiber correctly. |
| | There's dust or dirt on the fiber surface | Prepare the fiber again. |
| | There's dust or dirt on lens | Execute the [Dust Check] after the lens are cleaned. |
| Fibers Mismatch | The fibers of two sides are different type. | It may result in large splice loss if you continue to splice, Please use the proper splice mode corresponding to the fibers. |
| Large Cleave Angle | Bad fiber end-face. | Check the condition of the fiber cleaver, if the blade is worn, rotate the blade to a new position or change a new one, and then re-prepare the fibers. |
| | [Cleave Limit] is set too low. | Increase the [Cleave Limit] to an adequate limit.(standard: 3.0°) |
| Large Core Angle | [Core Angle Limit] is set too low. | Increase the [Core Angle Limit] to an adequate limit. (standard:1.0°) |
| | Dust or dirt is on the V-groove or the clamp chip | Clean V-groove and clamp chip. Prepare the fibers and re-load them. |
| Focus Error | Too large axial offset. (>0.4μm) | Re-prepare the fibers |
| | The motor is not calibrated. | Execute [Motor Calibration]. |
| Dust Error | There's dust or dirt on the fiber surface. | Prepare the fiber again. |
| | The lens are coated in dust. | Execute the Dust Check after cleaning the lens. |
| | Cleaning Arc time is too short. | Set the Cleaning Arc time to be 180ms. |
| | Using the core alignment mode to splice the fiber which core is hard to read. | Use the MM splice mode (cladding alignment) to splice the fiber which core is hard to read. |
| Fiber is too fat | Overlap too much | Adjust overlap parameter. |
| | Motor is not calibrated | Calibrate and maintain the motor. |
| Fiber is too thin | The intensity of discharge is too low. | Execute [Motor Calibration] |
| | The intensity of predischarge is too high. | Decrease the intensity and the time of predischarge appropriately. |
| | Short of overlap | Adjust overlap parameter. |

# Appendix III

**Questions and Troubleshooting**

1. Power does not turn off when pressing NO/OFF button.
★ Press and hold the key until the LED color changes from green to red.
2. Few splices can be made with a fully charged battery pack
★ If the power saving function is not enabled, battery power degrades quicker.
★ Always enable it to conserve power usage.
★ If degradation appears (memory effect), or if the battery pack is stored for an extended period of time, completely discharge it. After discharge completion, recharge the battery pack.
★ The battery pack has reached the end of its service life. Install a new battery pack.
★ The battery pack uses chemical reaction. The capacity decreases at low temperature,especially at lower than 0 degree C.
3. Error message appears on monitor
★ Please refer to appendix II.
4.Inconsistent splice loss / High splice loss
★ Clean the V-grooves, fiber clamps, wind protector mirrors, and objective lenses.
★ Replace the electrodes.
★ Please refer to Appendix I.
★ The splice loss varies according to the cleave angle, arc conditions and fiber cleanliness.
5. Monitor suddenly turned off
★ The monitor will turn off after an extended period of splicer inactivity, if the power saving function is enabled. Press any key to return to the normal state.
6. Splicer power suddenly turned off without "Low Battery" message
★ The monitor will turn off after an extended period of splicer inactivity, if the power saving function is enabled. Press any key to return to the normal state.
7. Identify fibers error in AUTO mode
★ AUTO mode is applicable for SM, MM, NZ fiber. Errors may occurs while splicing special fibers.
8. Mismatch between Estimated splice loss and Actual splice loss
The estimated loss is a calculated loss, so it can be used for reference only.
The optical components of the splicer may need to be cleaned.
9. Fiber protection sleeve does not shrink completely.
Extend the heating time.
10. Method to cancel heating process.
Press Heat key to stop during heating process. The LED light will go off after pressing.

11. Fiber protection sleeve adhered to heating plate after shrinking
Use a cotton swab or a similar soft tip object to push and remove the sleeve.
12. Forgot password
Please contact the sale agent.
13. No arc power change after [Arc Calibration]
An internal factor is calibrated and adjusted for the specific arc power selected. The displayed arc power in each splice mode does not change.
14. Forgot to load fibers while execute some specified function that fibers are needed.
RETURN key is invalid. Open the wind protect shield, load prepared fibers in the splicer, and press SET to continue or press RESET.
15. Upgrading failure
★ When users use the "new" U-disk to upgrade, the splice may not be able to correctly identify the upgrade file, you need to re-plug the U-disk, and restart the splicer.
★ Check if the upgrade file name and the format are correct.
★ If you cannot solve the problems, please contact the sale agent.
16. Other
Please refer to the video in user's CD.

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# The End

* Design is subject to change without prior notice.